International Online Conference on Advanced Research in Biology, Ecology, Science and Technology
(ICARBEST'15)
Organized by
International Journal of Advanced Research in Biology, Ecology, Science and Technology (IJARBEST)
19th November 2015

Traffic Light Based Intelligent Routing Strategy for Satellite Network

P.Ebenezer Benjamin[1], S.Abishek[2], Christo Ananth[3]

U.G.Scholar, Department of ECE, Francis Xavier Engineering College, Tirunelveli[1]
U.G.Scholar, Department of CSE, Francis Xavier Engineering College, Tirunelveli[2]
Associate Professor, Department of ECE, Francis Xavier Engineering College, Tirunelveli[3]

Abstract— **This scheme investigates a traffic-light-based intelligent routing strategy for the satellite network, which can adjust the pre-calculated route according to the real-time congestion status of the satellite constellation. In a satellite, a traffic light is deployed at each direction to indicate the congestion situation, and is set to a relevant color, by considering both the queue occupancy rate at a direction and the total queue occupancy rate of the next hop. The existing scheme uses TLR based routing mechanism based on two concepts are DVTR Dynamic Virtual Topology Routing (DVTR) and Virtual Node (VN). In DVTR, the system period is divided into a series of time intervals. On-off operations of ISLs are supposed to be performed only at the beginning of each interval and the whole topology keeps unchanged during each interval. But it has delay due to waiting stage at buffer. So, this method introduces an effective multi-hop scheduling routing scheme that considers the mobility of nodes which are clustered in one group is confined within a specified area, and multiple groups move uniformly across the network.**

Index Terms— **TLR based routing, VN,DVTR.**

I. INTRODUCTION

Routing is the process of selecting best paths in a network. The term routing was also used to mean forwarding network traffic among networks. However this latter function is much better described as simply forwarding. Routing is performed for many kinds of networks, including the telephone network (circuit switching), electronic data networks (such as the Internet), and transportation networks. This article is concerned primarily with routing in electronic data networks using packet switching technology.

VoIP services have become popular in the last decade, because of their cost effectiveness and simultaneous voice-data transmission in a single session. Satellites offer mobileand fixed services with high bandwidth and global coveragewhich make their usage quite attractive for telecommunications. Combining these two technologies results in state-of-the-art and efficient systems. New generation satellites, rather than old-fashioned "bent pipes", can achieve on-boardprocessing resulting in faster service and higher performanceat the cost and complexity trade off. With the deployment of third-generation (3G) and advent of fourth-generation (4G) networks, these capabilities will be crucial for better servicesand help the implementation of "ubiquitous and pervasive communications" concept.

VoIP performance issues in multi-layered satellite IP networks with on-board processing capabilities. Performance is an important consideration of asystem which renders it accepted or declined by the users. Therefore, parameters affecting the performance should beelaborated. Since voice applications are real-time applications, delay and delay variation are key parameters for the system performance. To achieve an intelligible communication, delay must be restricted to some certain values specified by the authorities (such as ITU and ETSI). For satellite networks, the significance of delay becomes more apparent where one way satellite latency is about 250–280 ms for geostationary orbit (GEO) satellites. The orbit of satellite - low-earth orbit (LEO), medium-earth orbit (MEO) or GEO -affects the propagation delay, therefore the overall system performance.

In this method, single layer and multi-layered satellite systems, consisting of LEO and MEO, are taken into consideration. On-board processing which includes the OSIlayer 1, 2 and 3 functions improves the performance of the application and tries to ensure the proposed quality. Therefore, it is crucial for any QoS aware integrated satellite architecture. To examine VoIP performance for NGEO single layer and multi-layered constellations using a network simulation tool.Subsequently, the effects of some QoS mechanisms, namely priority queuing and error-correcting-coding (ECC), in multi-layered architecture are tested using various simulation parameters.

VoIP traffic patterns are created as duplex and symmetric voice communication streams. For a more realistic modeling, GSs generate also background data traffic.Traffic source generators are based on the conventional Poisson generation process, with exponentially distributed interarrivaltimes. Packet length is also exponentially distributed with a mean value of 1000 bytes. The capacity of all UDLs, intra and inter-plane ISLs, and IOLs are chosen as 80 Mbps.Furthermore, each outgoing link has been allocated a bufferspace of 5MB. Buffer space corresponds to 5000 packets asopposed to 10000 packets/s capacity of links. Three different traffic types are modeled: short distance, long distance and random traffic. In short distance communication, each GSis in communication with another GS in close vicinity, in other words both stations are in the footprint of the same LEO.

Long distance communication represents long-haul or intercontinental communication. Random communication case allows random pairs of GSs to have voice and data sessions.When the scenario starts running, GS source-destinationpairs are uniformly chosen and it generate packets for the entire duration of simulation. A GS sends packets to the corresponding LEO in sight. After LEO receives a packet, it checks the destination address to see if it is in footprint. LEOsare assumed to have knowledge about the network topology, each LEO is aware of GSs in its own footprint and also the other satellites' footprints.

This information can be updated to all satellites by some special terrestrial stations or satellite scan form overall network topology by some signaling exchange. If GS is in the coverage of the LEO, packets are forwarded directly to the destination GS. If not, LEO knows which the corresponding LEO that has the destination in coverage is. Since a LEO has direct communication links toonly four neighboring satellites, it can route the incoming packet through one of these outgoing links. Determining the outgoing link depends on the destination satellite. Optimal shortest paths are determined using Dijkstra's Shortest Path Algorithm.

Intra-plane ISL delay values are always fixed and can be calculated using Equation 1. However, the length of inter-plane ISLs are variable and thus, the propagation delay on them is changing all the time in company with the constellation. There are 11 satellite delay groups alternating between 10 ms near Polar Regions and 29 ms near equatorial region.

II. EXISTING SYSTEM

Satellite-based networking [1] has developed in complexity over the years, rising up and building upon established work at the various networking layers as described by the ISO OSI Reference Model.1 Networking using satellites began by using simple transparent bent-pipe repeaters in geostationary orbit, where uplinked signals were amplified, frequency-shifted and broadcast down to a large ground area.

Sharing of this broadcast physical and data-link layer capacity led to the introduction of increasingly complex media access control (MAC) schemes to use capacity effectively, most notably with slotted aloha and its variants for use with very small aperture terminal (VSAT) networks. The development of multiple spot beams per satellite led to on-board switching and MAC, with control of capacity allocated via circuits' and a Logical Link Control (LLC) sub layer.

Development of direct radio or laser inter-satellite links (ISLs) between satellites and the design of constellations utilizing ISLs, such as Iridium, Teledesicand Space way, has led to consideration of dynamic adaptive routing algorithms for communication across a steroidal mesh of ISLs between multiple satellites; the space segment has now reached the network layer, and satellites in such constellations must support onboard routing as well as onboard switching. In this case, the satellite constellation itself is a true network; in conjunction with its terrestrial gateway stations it forms an autonomous system (AS).

The explosive growth of the Internet, connectionless routing [2] is being pushed to satellite networks. To realize this, satellites carry IP switches that forward packets independently.These IP switches are connected to each other as well as to ground stations. There are several proposals regarding the IP-based routing in satellite networks. The so-called Darting algorithm delays the exchange of topology update information until it is necessary to send data packets. However, it is shown in that the Darting algorithm does not reduce the protocol overhead. The datagram routing algorithm aimsto route the packets on minimum propagation delay paths using a distributed routing protocol. The routing protocol presented in uses a hybrid approach that uses geographic-basedrouting and shortest path routing with limited scope.The existing routing algorithms described above for satellite IP networks are based on the LEO satellites architectures only.However, to believe that a combination of different layers of satellites, such as LEO, MEO, and geostationary Earth orbit (GEO) satellites, would yield a much better performance than these layers individually.

Therefore, to propose a satellite network architecture that consists of satellites in three layers, and introduce the multilayered satellite routing algorithm (MLSR) that calculates shortest delay paths efficiently between the satellites in the satellite network and the gateways on the Earth. With MLSR, the routing tables are updated regularly to cope with the satellite mobility and the changes in the network load.

In [3], to propose several scheduling schemes and compare, for each scheme, the average throughput of the network when it reaches steady-state. Specifically, this study the throughput of random packet win (RPW) scheme, where the winning packet is chosen at random; oldest packet win scheme(OPW), where the packet that has traveled the longest distance toward its destination receives priority; and shortest hop win(SHW) scheme, where the packet that has the shortest distance to its destination receives priority over other continuing packets.

Both this analytic and simulated results show that, in the case of no buffer at each node, SHW scheme attains the best throughput performance, OPW scheme the second, and RPW the worst.These results can be intuitively explained by noting that the SHW scheme gives preference to packets that are about to exit the system and, hence, leads to improved system throughput. Similarly, the OPW scheme gives preference to packets that have traveled a longer distance and, hence, may be closer to their destination than other packets. Surprisingly, to found that when there is a buffer at each node, the performances of the three schemes are very similar in terms of throughput.

Moreover to found that even a small buffer size can achieve throughput close to that of an infinite buffer size.

Finally, these schemes give priority to continuing packets over new packets; hence, packets are typically not dropped inside the network, but are prevented from entering the network at their origin. When packets are dropped inside the network, due to contention or buffer overflow it is as assumed that those packets will be retransmitted by higher layer protocols (for example, by a link layer protocol that is designed to operate over the satellite system). The operation of such retransmission protocols is a well studied topic that is outside the scope of this paper. Instead, to assume that the packets arrive at each node with a rate, that includes both new packets and retransmissions of old packets. Such an assumption is often used in the analysis of multiple-access protocols.

While research on the element technologies have been studied well, studies on energy management with renewable energy are not relatively developed. In case of on-grid photovoltaic systems connected to commercial electricity grids directly through inverters. Power consumption can be decreased in buildings or homes, but there could also be energy loss when power consumption is very low or electricity price are cheap, and vice versa. We are interfacing solar energy with grid. There are many types of renewable energy such as solar, wind, tidal etc., in our project we proposes solar energy since it is convenience for us.

III. PROPOSED SYSTEM

This method is widely adapted to permutation traffic pattern, in which there are in total n distinct flows (source-destination pairs) in the network. Every node is the source of its locally generated flow, and meanwhile the destination of another flow originated from a different node. We further assume that the flow originated from each node is a Poisson stream of rate λ (packets/slot). The packet arrival process is independent of the node movements, and each packet arrives at the beginning of a time slot.

It is convenient to employ different transmission ranges for multiple hops of our routing scheme. Recalling that the protocol model requires the same transmission range for each time slot, we assume that each time slot is divided into inter- or intra-group transmissions. More specifically, for a generic time slot t, we only allow transmissions between nodes in different groups when $|t|_2 = 0$, (here $|.|_m$ denotes the modulus-m operation), and otherwise, only transmissions between nodes in the same group are permitted. This scheme focuses on the scheduling of inter-group communications first. Let r1 denote the transmission range of intergroup transmissions, and we assume that the transmission area of s, which we denote by As, is a square area centered at s and of edge length r1. To maximize the concurrent transmissions, the network region is divided into multiple interference- free transmission groups. Firstly, this scheme divide the network into cells of edge length r1 in the slot devoted to the first two hops. The shaded cells are a possible division of transmission group with a horizontal and vertical distance of d1 away from each other. Take cell C_k as an example. We denote G_k as the maximum area where we can find a receiving node of an arbitrary transmitter falling into C_k, and T_k as the area where we cannot find any other receiving node of a different communication pair. According to the protocol model, by spacing the cells by distance $d_1 = (3+\Delta)r_1$, this can ensure successful simultaneous transmissions among cells within a transmission group. Note that there are in total $(3+\Delta)^2$ transmission groups and in each group there are $\frac{n}{d_1^2}$ cells. The transmission groups alternatively get transmission opportunities and thus each transmission group will be active every $\frac{(3+\Delta)^2}{2}$ time slots. Therefore, by the scheduling scheme introduced above, the inter-group transmission is valid in every two time slots and each cell will also be active in every $\frac{(3+\Delta)^2}{2}$ time slots. If there are more than one node residing in an active cell, a transmission node will be randomly chosen from them.

Now about the scheduling of intra-group communications. Recalling that there are q nodes roaming in an i.i.d. fashion over the cluster-region, we divide the $l \times l$ area of a cluster-region into q non-overlapping cells of equal size. If two nodes are within the same cell during a time slot, one can deliver a single packet to the other. Each cell can support exactly one packet delivery per time slot, and nodes in different cells cannot communicate with each other during the time slot. Note that the transmission range of intra-group transmissions well matches the typical distance between nodes belonging to the same group. The cell partitioning scheme here reduces the scheduling complexity and facilitates analysis.

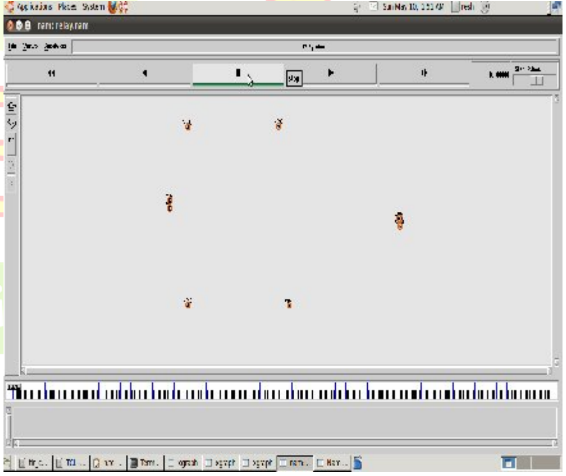

Fig.1. Node Formation

Fig.1. shows that the node formation. Numbers of nodes are formed to transmit the data from one node to another node. Each node is considered as vehicle.

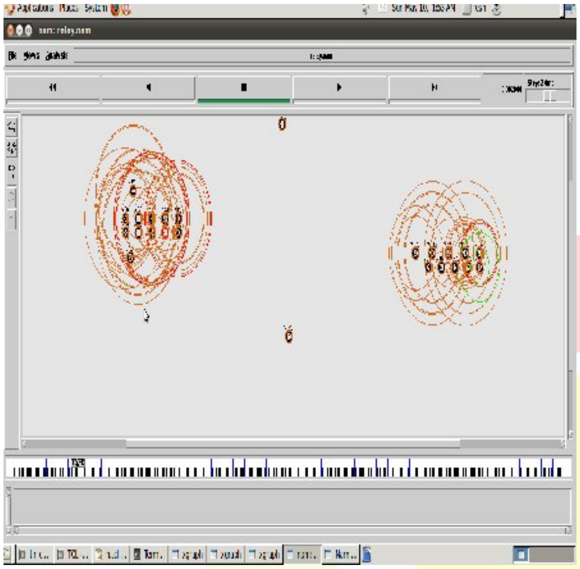

Fig.2. Data transmission between nodes

Fig.2. shows that the number of packets transmitted from beween nodes. At a time data transmitted from the different nodes.

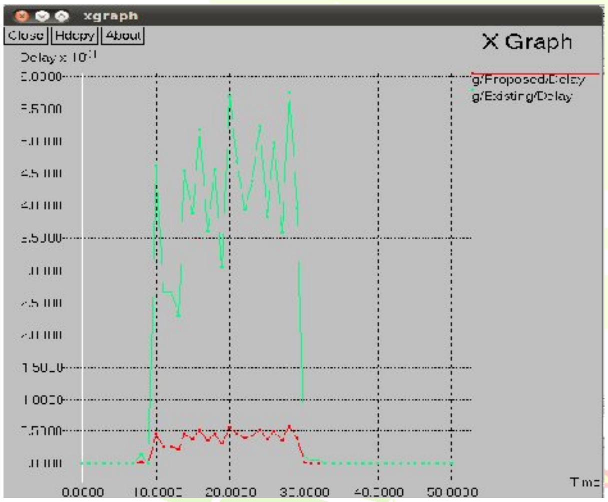

Fig.3. Delay graph

Fig.3. shows that comparison graph of delay between existing and proposed system. The delay decreases from the previous method. It also reduces the time delay and packet transmission delay.

IV. CONCLUSION

This scheme investigates a traffic-light-based intelligent routing strategy for the satellite network, which can adjust the pre-calculated route according to the real-time congestion status of the satellite constellation. In a satellite, a traffic light is deployed at each direction to indicate the congestion situation, and is set to a relevant color, by considering both the queue occupancy rate at a direction and the total queue occupancy rate of the next hop. The existing scheme uses TLR based routing mechanism based on two concepts are DVTR Dynamic Virtual Topology Routing (DVTR) and Virtual Node (VN). In DVTR, the system period is divided into a series of time intervals. On-off operations of ISLs are supposed to be performed only at the beginning of each interval and the whole topology keeps unchanged during each interval. But it has delay due to waiting stage at buffer. So, this method introduces an effective multi-hop scheduling routing scheme that considers the mobility of nodes which are clustered in one group is confined within a specified area, and multiple groups move uniformly across the network.

REFERENCES

[1] L. Wood, A. Clerget, I. Andrikopoulos, G. Pavlou, and W. Dabbous, “IP routing issues in satellite constellation networks,” International J. Satellite Commun., vol. 19, pp. 69–92, 2014.

[2] T. Taleb, A. Jamalipour, N. Kato, and Y. Nemoto, “IP traffic load distribution in NGEO broadband satellite networks,” in Proc. 2013 International Conf. Comput. Inf. Sciences, pp. 113– 123.

[3] M. Werner, “A dynamic routing concept for ATM-based satellite personal communication networks,” IEEE J. Sel. Areas Commun., vol. 15, no. 8, pp. 1636–1648, Oct. 2012.

[4] T. Henderson and R. Katz, “On distributed, geographic-based packet routing for LEO satellite networks,” in Prof. 2010 IEEE Global Telecommun. Conf., vol. 2, pp. 1119–1123.

[5] B. Jianjun, L. Xicheng, L. Zexin, and P. Wei, “Compact explicit multi-path routing for LEO satellite networks,” in Proc. 2009 High Performance Switching Routing Workshop, pp. 386–390.